

# (12) UK Patent Application (19) GB (11) 2 190 649 (13) A

(43) Application published 25 Nov 1987

(21) Application No 8711291

(22) Date of filing 13 May 1987

(30) Priority data

(31) 8612324

(32) 21 May 1986

(33) GB

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(51) INT CL<sup>4</sup>  
B60P 1/44

(52) Domestic classification (Edition I)  
B8E 22B1

(56) Documents cited  
GB 1167745

(58) Field of search  
B8E  
Selected US specifications from IPC sub-class B60P

## (54) Vehicle lift

(57) A cantilever type tail lift 1 comprises a parallelogram linkage having a base member 12 disposable at the vehicle underside 11, an articulated link member 14 and a telescopic link member 15, and a movable member 16 having a ramp 7 extending therefrom. The members are pivotally interconnected so that said ramp 7 is movable between a lowered position and a raised position adjacent vehicle platform 6, whilst remaining generally parallel to said load platform 6, by a first displacement means 19. The movable member 16 and ramp 7 are pivotable relative to the articulated link member 14 without substantial pivotal movement of the telescopic link member 15 and with partial telescoping of the telescopic link member 15, so as to swing the movable member 16 with the ramp 7 to a folded condition up and over relative to the articulated link member 14. The articulated link member 14 is then at least partly foldable upwardly by a further pivotal displacement means 31 with further telescoping of the telescopic link member 15, the link members 14, 15 then being further pivotable upwardly relative to the base member 12 towards the vehicle underside 11 by the first pivotal displacement means 19.

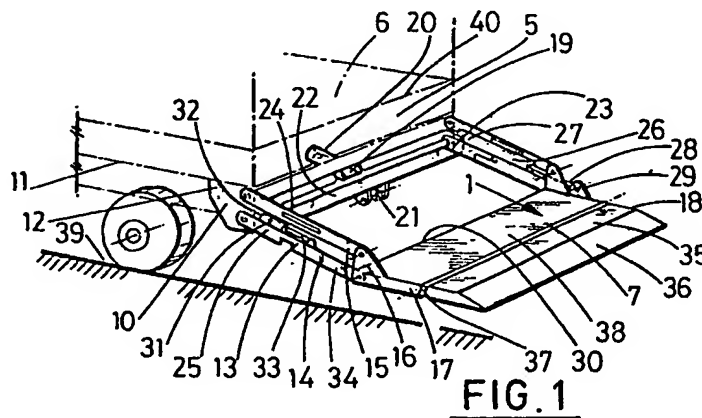
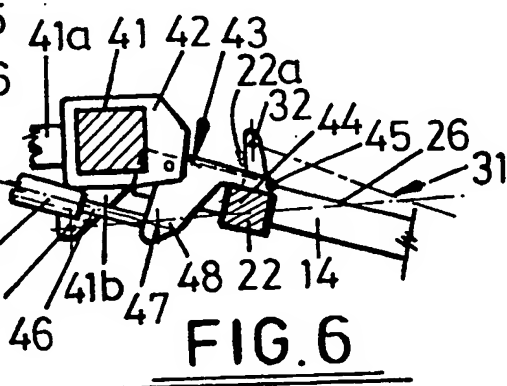
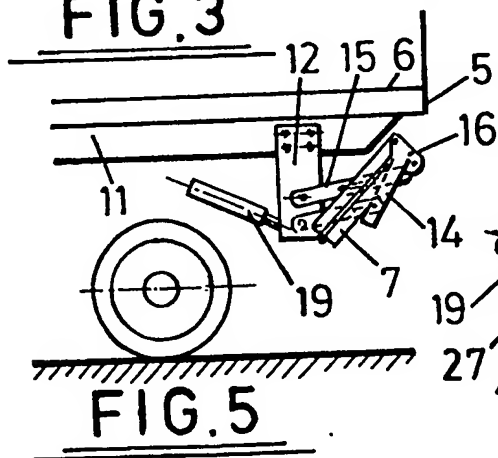
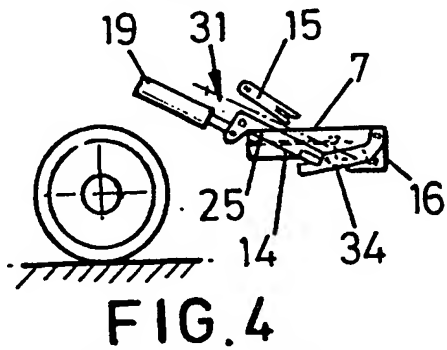
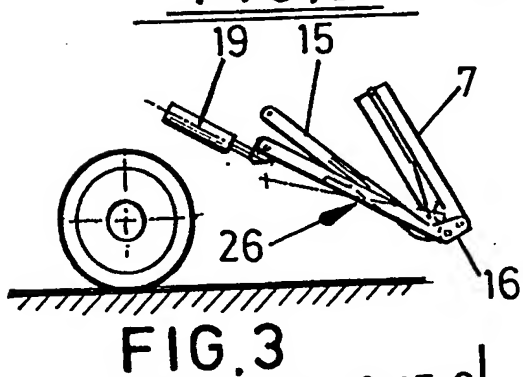
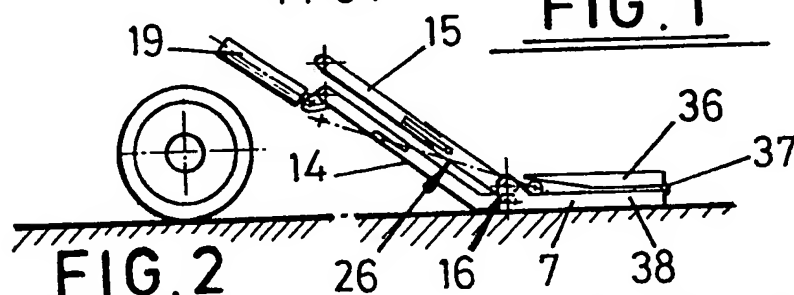
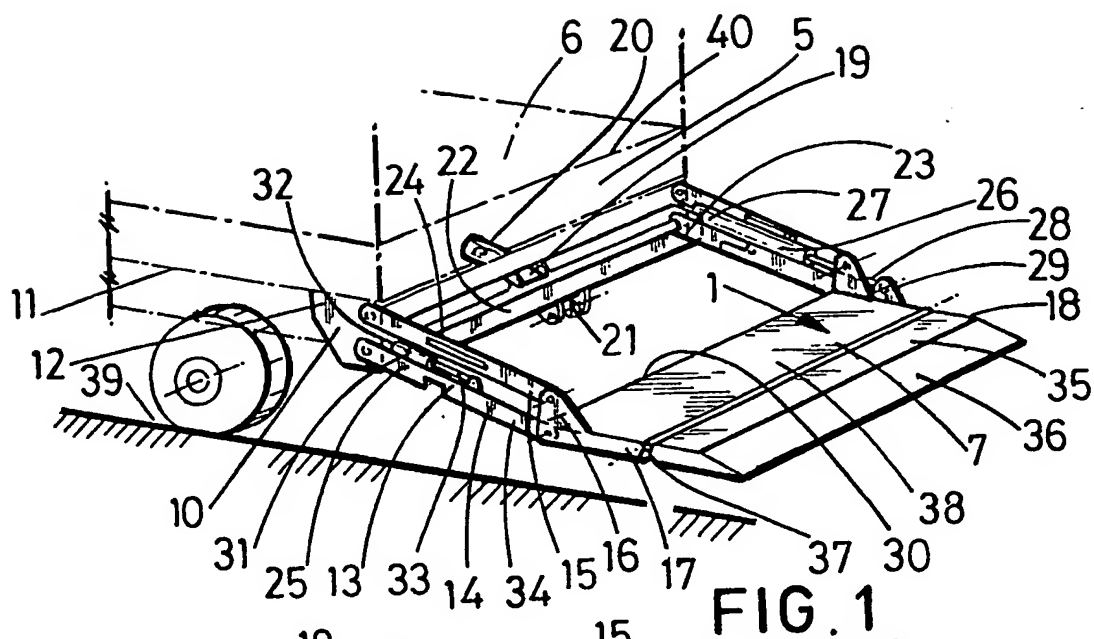


FIG. 1

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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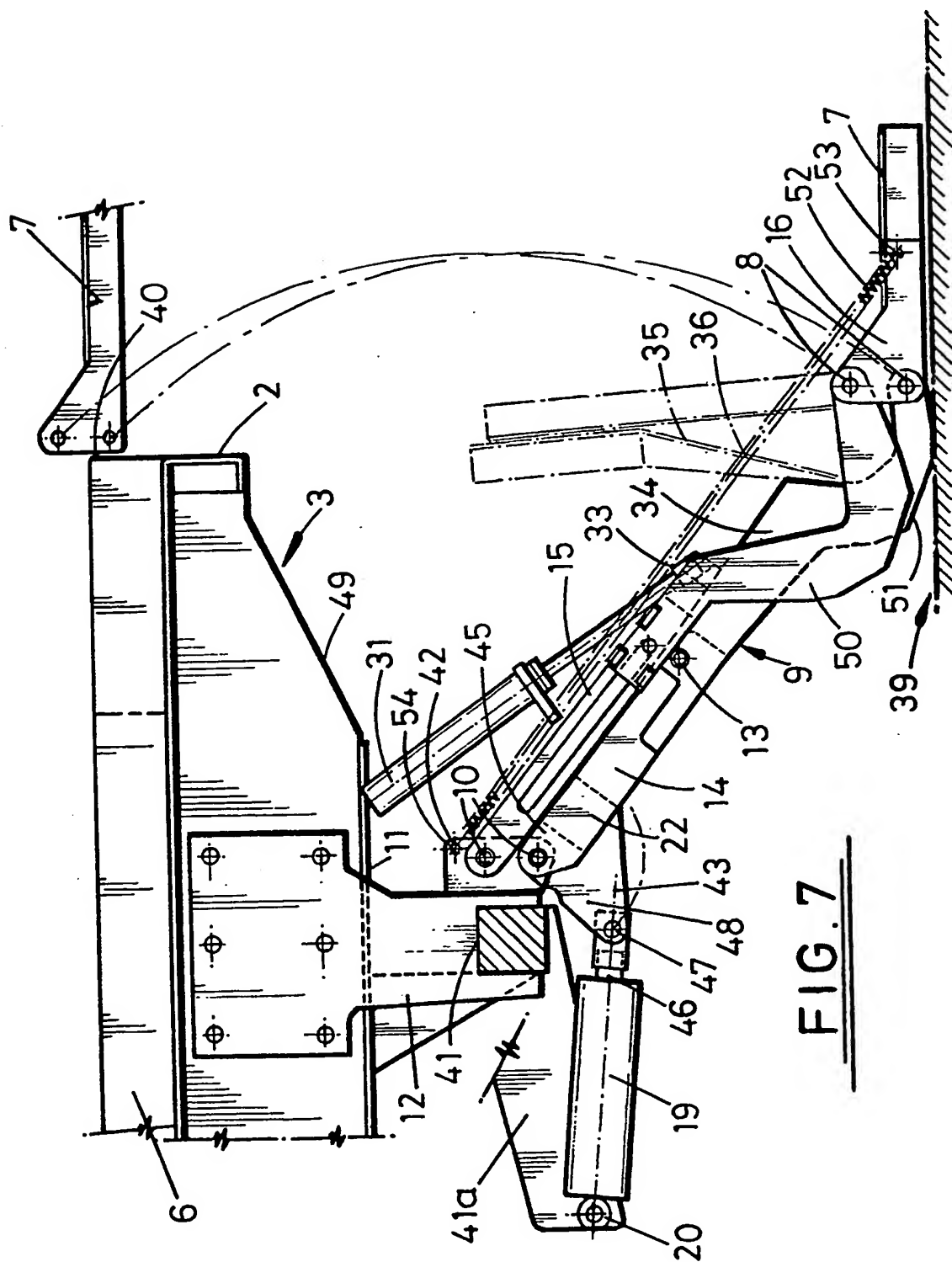


FIG. 7

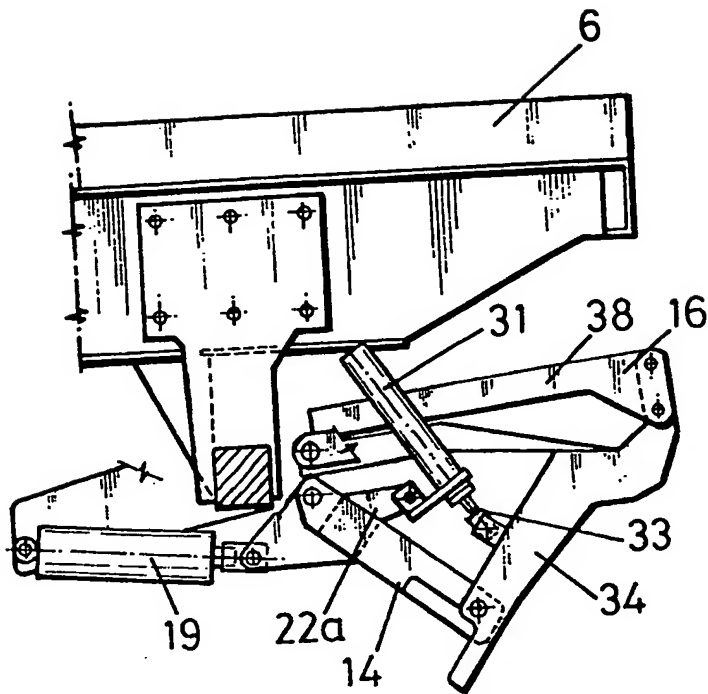
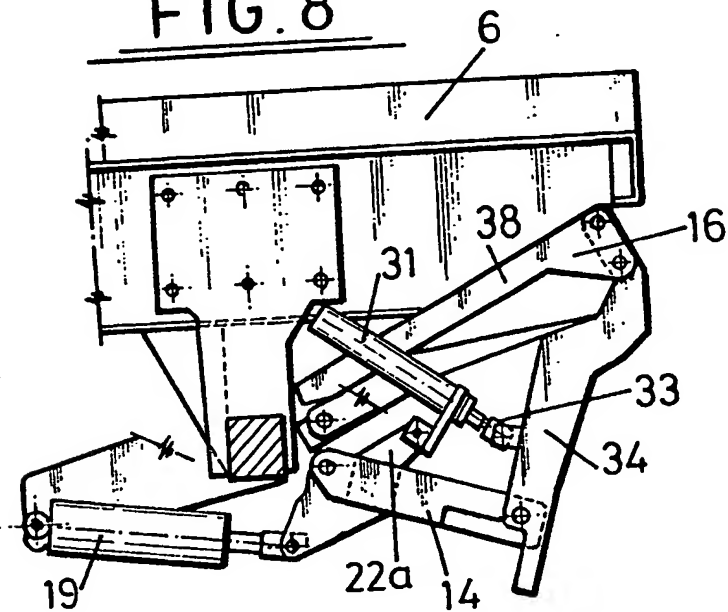


FIG. 8



**FIG. 9**

## SPECIFICATION

## Vehicle lift

- 5 The present invention relates to vehicle lifts and in particular to cantilever type lifts suitable for attachment to the rear or side of a vehicle for use in loading and unloading of the vehicle.
- Previously known cantilever lifts are generally
- 10 swung upwardly against the rear of the vehicle across the opening thereat and project to a greater or lesser extent from the vehicle thereby preventing a close approach of the vehicle to a loading bay platform.
- 15 It is an object of the present invention to avoid or minimize one or more of the above disadvantages.
- The present invention provides a vehicle lift comprising a generally parallelogram form linkage having a base member disposable at the underside
- 20 of a vehicle, an articulated link member and a telescopic link member, and a movable member having a ramp means extending therefrom, said base, link and movable members being pivotally interconnected so that in use of the ramp said ramp
- 25 is movable between a lowered position on the ground adjacent the vehicle and a raised position adjacent a load carrying platform of the vehicle whilst remaining generally parallel to said load platform, by a first pivotal displacement means, said
- 30 movable member and ramp being pivotable relative to the articulated link member without substantial pivotal movement of the telescopic link member and with partial telescoping of the telescopic link member, so as to swing the movable member with
- 35 the ramp in its folded condition up and over relative to the articulated link member, said articulated link member then being at least partly foldable upwardly by a further pivotal displacement means with further telescoping of said telescopic link member, said link
- 40 members then being further pivotable upwardly relative to the base member towards the underside of the vehicle by said first pivotal displacement means.
- If conveniently an auxiliary pivotal displacement
- 45 means is provided for use in swinging upwardly the folded ramp prior to folding up of the articulated link member, though if desired the ramp may be swung up manually, advantageously with spring-assistance from a suitably mounted resilient biasing means.
- 50 With a vehicle of the invention the relatively extended parallelogram linkage required to provide the necessary ramp lifting action is substantially reduced in extent in the stowed position so that the linkage and the ramp are both stowable below the
- 55 vehicle underside substantially out of the way thereby permitting the vehicle to approach a loading platform more or less as closely as a similar vehicle without a cantilever tail lift.
- Various suitable pivotable displacement means
- 60 may be used in accordance with the present invention. Conveniently pressurized fluid operated piston and cylinder means are used especially hydraulically operated, preferably
- 65 electro-hydraulically operated, ones.
- Further preferred features and advantages of the

present invention will appear from the following detailed description given by way of example of some preferred embodiments illustrated with reference to the accompanying drawings in which:

- 70 *Figure 1* is a generally schematic perspective view of a tail lift of the invention mounted on the rear of a vehicle;
- Figures 2 to 5* are schematic and partially omitted side views showing the principal stages of the stowing operation of the tail lift of *Figure 1* with the successive positions of the principal parts thereof; and
- Figures 6 to 8* are generally similar schematic and partially omitted side views showing the principal stages of the stowing operation of a further embodiment of the invention.
- Figure 1* shows a tail lift 1 of the invention mounted at the rear 2 of a vehicle 3 (shown in chain line) adjacent and below a rear opening 4 and the rear end
- 85 5 of the load deck 6 of the vehicle 3. The tail lift 1 comprises a load platform 7 mounted 8 on a generally parallelogram form linkage 9 which is in turn mounted 10 at the underside 11 of the vehicle load deck 6.
- 90 In more detail the parallelogram linkage 9 comprises a base member 12 which is secured to the vehicle underside 11, a first, articulated 13, link member 14, a second, telescopic, link member 15, and a movable member 16 secured to the load
- 95 platform 7. As may be seen in *Figure 1*, the parallelogram form linkage means comprises two substantially identical units disposed at opposite sides 17, 18 of the load platform and vehicle assembly.
- 100 A first pivotal displacement means 19 is mounted along the longitudinal centre line of the vehicle centrally between the sides 17 and 18. One end 20 of the displacement means 19 is secured to a main beam bracket 41a (See *Figure 6*) and the other is
- 105 pivotally connected 21 to a transverse beam 22 whose opposite ends 23, 24 are connected to respective ones of the articulated link members 14 at the inboard ends 25 thereof in proximity to the base member 12. An auxiliary pivotal displacement
- 110 means 26 has one end 27 connected to a main beam lug 41b (see also *Figure 6* below) and its other end 28 connected to the load platform 7 at a connection lug 29 spaced outwardly from the inboard edge 30 of said load platform 7.
- 115 A further pivotal displacement means 31 has one end 32 connected to a transverse beam lug 22a and its other end 33 connected to the outboard end portion 34 of the articulated link member 14. The load platform 7 has an outboard section 35 with a tapered free edge 36 for facilitating movement of wheeled goods containers (not shown) onto and off
- 120 the load platform and is hingedly connected 37 to an inboard section 38.
- In use of the tail lift 1, with the load platform 7 and the parallelogram linkage 9, fully deployed as shown in *Figure 1*, the load platform is maintained substantially parallel to the vehicle load deck 6 and is pivotally movable between a lowered position adjacent the ground 39 immediately behind the
- 130 vehicle and a raised position immediately behind the

rear end 40 of the vehicle load deck 6 whilst being maintained in said substantially horizontal attitude, the movement being effected by the first pivotal displacement means 19 which is retracted in the lowered position and extended in the raised position of the load platform.

The sequence of operations involved in stowing of the tail lift will now be described with reference to Figures 2 to 5, in which various parts have been omitted and the second and third pivotal displacement means represented by their centre lines only, for the purposes of improved clarity. With the load platform 7 in its lowered position, the outboard section 35 is folded over onto the inboard section 38. The auxiliary pivotal displacement means 26 is then retracted swinging the load platform 7 over to an angle of approximately 120° towards the rear end 5 of the load deck 6 resulting in partial telescoping of the telescopic link member 15 and a pivotal displacement of the articulated link member 14 relative to the telescopic link member 15 so that they assume a partially crossed-over disposition as viewed from the side (see Figure 3). Retraction of the further pivotal displacement member 31 then causes the articulated link member to break around its articulated joint 13 with further telescoping of the telescopic link member 15 (see Figure 4). The first pivotal displacement means is then extended to swing the by now substantially folded up tail lift close up against the vehicle underside 11 as shown in Figure 5. As may be seen in this drawing the tail lift in its fully stowed position does not project beyond the rear end 5 of the load deck 6 as is the case in conventional cantilever type tail lifts, thereby permitting close approach of the vehicle to a loading bay platform when the tail lift is stowed.

It will be appreciated that various modifications may be made without departing from the scope of the present invention. Thus for example although the pivotal displacement means shown in the drawings are in the form of piston and cylinder means, other well known mechanical devices could be used in their place.

Figure 6 is a detail view further illustrating the connections between the first and second pivotal displacement means 19, 26 and the other parts of the tail lift.

Figure 6 shows a main mounting beam 41 which extends between the downwardly depending base members 12 at either side of the vehicle. A pair of generally annular flanges 42 on the main beam 41 have pivotally mounted thereon bell-crank swivel brackets 43 to which the transverse beam 22 is secured 44 on one of the arms 45 thereof. The piston rod 46 of the first pivotal displacement means 19 is pivotally connected 47 to the other arms 48 of the bell-crank swivel brackets 43. As already noted above, one end 32 of the further pivotal displacement means 31 is connected to the transverse beam lug 22a.

As may be seen from the drawings the embodiment of Figures 7 to 9 is generally similar to that of Figures 1 to 6 and like parts have been identified by like reference numerals. In this second embodiment of Figures 7 to 9 the auxiliary piston and

cylinder means 26 has been omitted and the movement of the ramp 7 between its fully lowered position and its initially folded up position, respectively shown by the solid line and chain-like outlines in Figure 7, is effected instead manually with spring assistance from a resilient biasing means in the form of an elongate helical spring 52 (see Figure 7) at each side of the ramp 7, having one end 53 secured to the movable member 16 and 1b other end 54 to the main beam annular flange 42.

Figures 7 to 9 also show in more detail a suitable form and mounting arrangement for the further piston and cylinder means 31 used to fold up the articulated link member 14. The drawings show the rear end 49 of the vehicle underside 11 slightly recessed so as better to accommodate the folded up ramp 7 in its fully stowed position directly thereunder (see Figure 9). Finally it may be noted from Figure 7 in particular that the distal end portions 50, 51 of both the articulated and telescopic link members 14, 15 are generally hook shaped.

#### CLAIMS

1. A vehicle lift comprising a generally parallelogram form linkage having a base member disposable at the underside of a vehicle, an articulated link member and a telescopic link member, and a movable member having a ramp means extending therefrom, said base, link and movable members being pivotally interconnected so that in use of the ramp said ramp is movable between a lowered position on the ground adjacent the vehicle and a raised position adjacent a load carrying platform of the vehicle whilst remaining generally parallel to said load platform, by a first pivotal displacement means, said movable member and ramp being pivotable relative to the articulated link member without substantial pivotal movement of the telescopic link member and with partial telescoping of the telescopic link member so as to swing the movable member with the ramp in its folded condition up and over relative to the articulated link member, said articulated link member then being at least partly foldable upwardly by a further pivotal displacement means with further telescoping of said telescopic link member, said link members then being further pivotable upwardly relative to the base member towards the underside of the vehicle by said first pivotal displacement means.

2. A lift according to claim 1 wherein said first pivotal displacement means is formed and arranged for acting between the base member and a proximal part of the articulated link member pivotally connected to said base member.

3. A lift according to claim 1 or claim 2 wherein said further pivotal displacement means is formed and arranged for acting between said proximal part of the articulated link member and a distal part of the articulated link member pivotally connected to the movable member.

4. A lift according to any one of claims 1 to 3 wherein said articulated link member has an articulated joint formed and arranged so as to have

substantial longitudinal rigidity in its fully extended condition.

5. A lift according to any one of claims 1 to 4 wherein is provided an auxiliary pivotal  
5 displacement means for effecting the pivotal displacement of the ramp and movable member relative to the articulated link member in the unfolded position of said articulated link member.

6. A lift according to claim 5 wherein said  
10 auxiliary pivotal displacement means is formed and arranged for acting between the base member and the ramp.

7. A lift according to any one of claims 1 to 6 wherein said pivotal displacement means are in the  
15 form of pressurized fluid operated piston and cylinder means.

8. A lift according to any one of claims 1 to 7 when mounted at the underside of a goods vehicle load deck immediately behind an edge of said deck at  
20 which edge there is open access to a loading surface of said load deck.

9. A vehicle lift substantially as described hereinbefore with particular reference to Figures 1 to 6 or Figures 1 to 6 as modified by Figures 7 to 9 of the  
25 accompanying drawings.